

REMARKS/ARGUMENTS

Claim Amendments

By the claim amendments presented, the subject matter of allowable Claim 58 would be incorporated into Claim 49, and original Claim 58 would be cancelled. Such amendments would have the effect of re-writing allowable Claim 58 in independent form, with amended Claim 49 representing that independent claim.

Upon entry of the claim amendments presented, Claims 1, 2, 4-15, 17-26, 28-39, 41-46 and 49-57 would remain in the application. No additional claim fees would be due as a consequence of making such amendments.

Invention Synopsis

As now claimed, the present invention in one embodiment is directed to an integrated process for the production of a dialkyl carbonate and a diol from an alkylene oxide, carbon dioxide (CO₂) and a monohydric alcohol. In a first process step of this embodiment, the alkylene oxide and CO₂ are reacted under certain specified conditions in the presence of a halogen-free carbonation catalyst selected from carbonates and bicarbonates of quaternary ammonium bases to produce a crude product stream containing a cyclic carbonate and the catalyst. In a second process step, the cyclic carbonate, catalyst from the first step, and monohydric alcohol are then reacted to provide another crude product stream comprising the desired dialkyl carbonate and diol. This resulting crude product stream has a halogen concentration of about 5 ppm or less.

In other process embodiments, a transesterification catalyst is used in the second step along with the first step carbonation catalyst. In still further embodiments, the process includes a preliminary step wherein the alkylene oxide and CO₂ reactants are themselves produced by reaction of an alkylene material with an oxygen-containing gas. In the process embodiment of allowed Claim 58 (after amendment herein, Claim 49), the process is carried out using a chlorine-free

carbonation catalyst which is [1,1'-(1-butylbenzimidazol-2-yl)pentane]copper(II) di(trifluoromethanesulfonate).

Premature Final Rejection

In the instant Final Rejection, a number of claims have been rejected for the first time as allegedly being unpatentably obvious under 35 USC §103(a) over a certain reference matrix containing a newly applied primary reference. Notwithstanding this new art rejection (discussed more fully below in the Art Rejection section), the Examiner has made the instant Office Action a Final Rejection on the grounds that “applicants’ amendment necessitated the new ground(s) of rejection.”

It is respectfully submitted that applicants’ amendment could not have necessitated the new ground of rejection presented in the instant Final Rejection because in applicants’ previously submitted July 20, 2007 response, the claims in the application were not amended at all. (The title of this July 20, 2007 submission was inadvertently characterized as an “Amendment and Response”. And in the Listing of Claims presented with this July 20, 2007 response, the status of Claims 25 and 38 was erroneously given as “Currently Amended”. It can be seen, however, that neither of these two claims, nor any other claims in the claim set, were actually amended in connection with applicants’ July 20, 2007 response.)

The previously applied art rejection has, in fact, been dropped because applicants in their July 20, 2007 response established that the primary reference (Buchanan et al/U.S. 6,407,279) from that previously applied art rejection was a commonly owned patent which could not be applied in a Section 102(e)/103 art rejection against applicants’ claims. In such an instance, the MPEP, in Sections 706.02(l)(3) and 706.07(a), notes:

“When applying any 35 U.S.C. 102(e)/103 references against the claims, the examiner should anticipate that the reference may be disqualified under 35 U.S.C. 103(c)... If a statement of common ownership or assignment is filed in reply to the 35 U.S.C. 102(e)/103 rejection and the claims are not amended, the examiner may not make the next Office action final if a new rejection is made.”

Given the foregoing considerations, it is submitted that application of the instant Final Rejection to the claims in this case is clearly premature and improper. Accordingly, if the claims presented herein are not to be allowed, it is submitted that the Examiner should at least withdraw the finality of this Office Action as set forth in MPEP Section 706.07(d).

Art Rejection

Claims 1, 2, 4-15, 17-26, 28-39, 41-46 and 49-57 have been finally rejected under 35 USC §103(a) as allegedly being unpatentably obvious over U.S. Patent No. 5,489,703 to Pacheco et al (hereinafter “Pacheco”), in view of the combination of U.S. Patent No. 3,535,341 to Emmons et al. (hereinafter “Emmons”) and U.S. Patent No. 2,873,282 to McClellan (hereinafter “McClellan”). The Examiner contends that it would have been obvious to utilize the quaternary ammonium carbonation catalysts of the secondary references in the Pacheco epoxide to alkylene carbonate to alkyl carbonate process, to thereby realize the process of applicants’ rejected claims. Such a rejection is respectfully traversed.

Pacheco discloses a process for reacting alkylene carbonates with alkanols in the presence of a transesterification catalyst which can include alkyl or aryl ammonium salts such as the halide, carbonate, or bicarbonate salts among many others. Pacheco notes that the ethylene carbonate reactant itself can be produced by reacting epoxides with carbon dioxide in the presence of catalysts such as carbonates or, most preferably, halides of organic nitrogen bases such as tertiary amines and quaternary ammonium bases along with many other catalyst types. There is no disclosure in Pacheco of using a crude alkylene carbonate product stream which still contains the carbonation catalyst as the reactant stream for transesterification of the alkylene carbonate with alkanols to produce alkyl carbonates. The only exemplified alkyl carbonate preparation in Pacheco involves combining a stream containing only ethylene or propylene carbonate and methanol with a potassium carbonate transesterification catalyst in glass tubes.

McClellan discloses reaction of alkylene oxides with carbon dioxide in the presence of a catalyst, which can be hydroxides, carbonates or bicarbonates of quaternary ammonium bases, to produce alkylene carbonates. There is no disclosure in McClellan of the further processing of any alkylene carbonate or alkylene carbonate-containing stream produced in accordance with the McClellan procedure.

Emmons discloses reaction of alkylene oxide with carbon dioxide to make a cyclic carbonate using hydrazine or hydrazine hydrohalide as a catalyst. In the Background section and in some comparative examples, Emmons teaches that quaternary ammonium bases such as tetraethylammonium carbonate, among many other possible types of catalysts, can be used to promote reaction of alkylene oxide with carbon dioxide. Emmons discloses nothing about what is or can be done with the crude reaction product of the alkylene oxide/CO₂ reaction other than to analyze it or to distill cyclic carbonate reaction product from it.

Applicants respectfully submit that the combined teachings of the Pacheco primary reference and the two secondary references do not lead to an obvious realization of applicants' claimed process. In the first place, there is nothing in any of the references which would suggest that the alkylene carbonate-containing crude product stream from the first step of the applicants' claimed process must be used in the second transesterification step without separating either the alkylene carbonate or the carbonation catalyst therefrom. The primary Pacheco reference is the only one of the three applied patents at all which even discloses a reaction step involving transesterification of alkylene carbonate with alkanol. And in that Pacheco process, there is clearly no disclosure or suggestion of using the same carbonation catalyst and the actual crude product stream from the carbonation step for the transesterification reaction. Instead, the Pacheco reference appears to separate out the alkylene carbonate product and combine it as a purified reactant with methanol in order to carry out the further reaction which produces the desired alkyl carbonate via the transesterification step.

In the second place, it is also clear that the combined teachings of Pacheco and the secondary references do not suggest applicants' selection of a halide-free carbonation catalyst which is to be used in both steps of applicants' claimed process.

Neither secondary reference, in fact, teaches applicants' essential transesterification step at all, let alone what type of catalyst might be useful therein. And, the primary Pacheco reference and at least one of the secondary references, Emmons, teach directly away from applicants' selection of halide-free carbonation catalysts by clearly indicating that the preferred carbonation catalysts for the reference processes are halides. The Pacheco patent, for example, teaches expressly that quaternary ammonium halides are "particularly preferred." And the preferred Emmons carbonation catalyst is hydrazine hydrohalide. In short, the skilled artisan reading Pacheco, McClellan and Emmons together would not be lead to the obvious realization of applicants' claimed process with its utilization in two process steps of the same carbonation catalyst and with its selection of halogen-free compounds for use as such a catalyst.

Given the foregoing considerations, it is submitted that neither Pacheco, McClellan nor Emmons, nor their combination, teaches or suggests all of the essential features of applicants' dialkyl carbonate preparation process as presently set forth in Claims 1, 2, 4-15, 17-26, 28-39, 41-46 and 50-57. Continued application of the Pacheco/McClellan/Emmons Section 103 art rejection against these claims would accordingly be improper.

Allowable Claim

In the instant Final Rejection, the Examiner indicates that Claim 58 would be allowable if rewritten in independent form. The claim amendments presented herein do just that by incorporating the subject matter of Claim 58 into Claim 49, the independent claim from which Claim 58 depends. Accordingly, Claim 49 as it would be amended herein represents previously presented Claim 58 rewritten in independent form. Amended Claim 49 should therefore, upon entry of the amendments presented herein, represent an allowable claim.

CONCLUSION

Applicants have made an earnest effort to place their application in proper form and to distinguish their claimed invention from the applied prior art.

WHEREFORE, reconsideration of this application, entry of the claim amendments presented, at least withdrawal of the finality of the instant Office Action but more preferably also complete withdrawal of the claim rejection under 35 USC §103, and allowance of Claims 1, 2, 4-15, 17-26, 28-39, 41-46 and 50-57, along with the already allowable Claim 49, are all respectfully requested. Alternatively, entry of the amendments presented herein in order to place the claims in better form for appeal is respectfully requested.

It is also respectfully requested that the Examiner expeditiously notify applicants' undersigned attorney as to the disposition of the amendments and arguments presented herein in accordance with MPEP §714.13.

If there are any questions regarding this response or the application in general, a telephone call to the undersigned would be appreciated, since this should expedite the prosecution of the application for all concerned.

Respectfully submitted,

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/Xiaobing Feng/

Xiaobing Feng
Attorney for Applicants
Registration No. 57,231

Post Office Address (to which correspondence is to be sent):
ExxonMobil Chemical Company
Law Technology
P.O. Box 2149
Baytown, Texas 77522-2149
Telephone No. (281) 834-0355
Facsimile No. (281) 834-2495

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